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relations of the plant associations. The headwaters of the Lena are in the steppe and the mouth is in the tundra, but most of the stream traverses a forest region. While larch, spruce, and pine dominate southward, the forests nearer the mouth are composed almost wholly of larch. Alluvial savannas decrease northward. Cajander employs "Bestand" in the ordinary sense, but uses "association" where most authors use "formation." "Series" is used for a group of genetically connected associations. The forest associations usually start with a thicket of *Salix viminalis*, which is succeeded by a mixed thicket, and later in turn by alders, birch, and spruce. The final stage on areas subject to overflow is a forest of spruce and larch; on alluvium above the freshet line there are pure larch forests. Various succession series are found in the meadows, differences being largely due to variations in the character of the soil; the final stages are very similar. An interesting variation in the succession series is shown by *Equisetum arvense* which precedes *Carex acuta* in rich soil, but comes after it in pure sand. In his concluding remarks, Cajander introduces the term "vicarious associations," by which he means associations that occupy similar places in the genetic series. Associations are climatically vicarious if they occur in different regions; *e.g.*, the *Carex acuta* association replaces northward the *Carex aquatilis* association of the upper Lena. One may cite as an illustration of edaphically vicarious associations the *Equisetum fluviatile* and *Eleocharis* associations which occupy a pioneer position in different soils of the same region.—H. C. COWLES.

#### A flora of northwest America.<sup>6</sup>

THOMAS HOWELL, so long known as an indefatigable collector, has brought together the results of years of field experience in a large volume describing the flowering plants of Oregon, Washington, and Idaho, a corner of the United States that had been left unprovided with a handy manual. Aside from the need of a manual for this region, the flora is one of the most interesting within our boundaries. The first fascicle of the present work was issued in 1897, although we are informed that the actual writing of the flora began in 1882, and now the completed seven fascicles appear in the volume before us. The sequence is that of Bentham and Hooker, the nomenclature is conservative, and the conception of species has been held to the old lines. Of the 3,150 species and varieties described 89 are new, but Mr. Howell is further to be credited with having contributed to monographers many more new species of his collecting.

This volume has been published under such unusual conditions, which are nowhere referred to in it, that they should be recorded. In 1896, when the first fascicle was ready for the printer, no typesetter able to set the tech-

<sup>6</sup> HOWELL, THOMAS, A flora of northwest America, containing brief descriptions of all the known indigenous and naturalized plants growing without cultivation north of California, west of Utah, and south of British Columbia. Vol. I. Phanerogamae. 8vo pp. 816. 1903. Portland, Oregon: The author. \$5.00.

nical matter could be found in Oregon. Accordingly the author learned to set type, and for nearly eight years has "set up" form after form until the 800 pages and more have been printed. We venture the assertion that no manual of botany, and probably no botanical work, has ever been issued at such a cost of labor to the author.

The value of the book is just what the experience of the author has made it, and no one knows so well the plants of the region covered. In addition to this, Mr. Howell is to be congratulated upon his indomitable pluck, in the presence of which a few typographical errors here and there and a little lack of typographical finish must be entirely forgotten.—J. M. C.

#### A study in heredity.

A STUDY in heredity by W. Johannsen<sup>7</sup> reaches the conclusion that Galton's law of regression is true in populations made up of several pure lines, but is not true in the pure lines taken singly. By a pure line is meant a group of individuals which have descended from a single self-fertilized individual. The author shows that a monomodal curve is not sufficient evidence that a population is homogeneous, but that a process of biological analysis must precede the general mathematical analysis, to attain satisfactory results. When Galton's law is found to hold in self-fertilizing populations it is interpreted as the result of incomplete isolation of the pure lines, and when the isolation is complete, *i. e.*, in a single pure line, there is complete regression of the mean characters of the offspring to the type of that line. This absolute fixity of type is too unique to be accepted without question, but if sustained by further research is a sufficiently important principle in questions of evolution in those special cases in which pure lines are involved; as in cleistogamous and other self-fertilizing populations, and in populations arising through parthenogenetic and vegetative reproduction. But exception may be taken to the author's view that the principle is fundamental to all study of heredity.

The results are based upon weight and form of seeds of *Phaseolus vulgaris* and on certain abnormalities in heads of rye. Only three generations are involved, and no account is taken of the influence of climatic fluctuations.—G. H. SHULL.

#### MINOR NOTICES.

THE VERMONT Agricultural Experiment Station has issued a bulletin dealing with the flow of maple sap.<sup>8</sup> The bulletin sets forth an enormous amount of experimental work, a large portion of which is directed to the physiological problems of sap pressure and sap flow. The effects of external

<sup>7</sup> JOHANNSEN, W., Ueber Erblichkeit in Populationen und in reinen Linien. pp. 68. *figs. 8*. Jena: Gustav Fischer. 1903.

<sup>8</sup> JONES, C. G., EDSON, A. W., and MORSE, W. J., The maple sap flow. Bull. 103, Vermont Agric. Expr. Sta. pp. 43-184. *figs. 6. pls. 17*. 1903.